

## Optimizing Injections in Nonoptimal Environments: The Marriage of HRSC with Advanced Injection Approaches to Treat TCE in Glacial Till

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**Background/Objectives.** Groundwater and soil contaminated with petroleum compounds and chlorinated solvents, including benzene, trichloroethene (TCE) and degradation products, have been studied at a former jet engine shop at the former Grissom Air Force Base for two decades. Historic site characterization and monitoring have documented four discrete groundwater plumes within a shallow aquifer bearing glacial till down to 30 feet below ground surface (bgs). High resolution site characterization (HRSC) programs were executed in June 2016 to refine the conceptual site model (CSM) and optimize a treatability study for the site. Based on the results of the site characterization, a focused remedial strategy involving a combination approach of Emulsified Lecithin Substrate (ELS™), SDC-9 and zero valent iron (ZVI) was selected for treatment at the site.

**Approach/Activities.** The results from the HRSC efforts supported the development of a more focused and cost-effective strategy for treatment at the site. A combination approach of ELS, ZVI and SDC-9 was used to target the three-plume area- the SHWAP plume, the Storm Sewer plume, and the Southeast plume. The general approach for the injection program utilized a top-down injection method, where a 2.25-inch diameter pressure-activated injection tool was driven into the subsurface using a Geoprobe® direct push technology (DPT) model 6620DT track mounted drilling rig. Each injection location included multiple injection intervals, with each interval vertically spaced 2.5 feet. Individual injection locations were divided amongst “single” and “double” dosage loading requirements based on total contaminant concentration. Through the course of the injection program a total of 29 injection points were completed with 20 locations in the SHWAP plume, 6 in the Storm Sewer plume, and 3 in the Southeastern plume.

**Results/Lessons Learned.** Results from the focused injection program, including loading calculations and contaminant concentration trends, will be shown and discussed to evaluate the viability of the approach. Lessons learned from the challenging injection programs will also be presented.